

The Population Conundrum Roundtable on Singapore's Demographic Challenges

Thursday, 3 May 2012
8.30 am – 5.30 pm
Ballroom 2, Level 3, Orchard Hotel



The Population Conundrum: Population Projections

Roundtable on Singapore's Demographic Challenges
3 May 2012



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Health warning!

- **Population projections represent the playing out into the future of certain assumptions about the course of fertility, mortality and net migration. They are NOT forecasts or predictions. (emphasis added)**
- **The utility of these projections is to illustrate the future effects of alternative assumptions of demographic trends.**

- Teitelbaum and Winter, *The Fear of Population Decline*, 1985

Objectives of the Population Projections

- **To model and compute demographic indicators for Singapore's resident and total population and labour force under different assumptions of fertility, migration and declining mortality.**
- **Stage 1: Projection of Resident Population**
 - *Scenarios of Future Population Growth and Change in Singapore, IPS 2011*
- **Stage 2: Projection of Total Population and Labour Force (new)**

Methodology and assumptions

Stage I. Projection of Resident Population

Base Population:

2005 resident population (comprising citizens and PRs)

Assumptions:

- **Scenario 1:** TFR remains constant at 1.24 births per woman from 2005 onwards and there is zero net addition of citizens/ PRs throughout the projection period 2005-2050
- **Scenario 2:** TFR remains constant at 1.24 births per woman from 2005 and 30,000 net addition of citizens/ PRs annually throughout the projection period
- **Scenario 3:** TFR rises gradually from 1.24 to 1.85 births per woman by 2015 before stabilising at this level and there is zero net addition of citizens/ PRs throughout the projection period
- Mortality assumptions are common for all three scenarios: life expectancy at birth increases from 77.4 years in 2005 to 79.7 years in 2050 for males, and from 81.3 to 84.6 years over the same period for females.

Methodology and assumptions

Stage II. Projection of Total Population and Labour Force

(a) Total Population Projection

Total Population = Resident Population plus Non-Residents (NR)/foreigners

Base Population:

Scenario 2 projected resident population

NR Assumptions:

- **Scenario 2A:** Non-residents make up 25% of the total population (1 in 4 is a non-resident/foreigner)
- **Scenario 2B:** Non-residents make up 20% of the total population (1 in 5 is a non-resident/foreigner)
- **Scenario 2C:** Non-residents make up 33% of the total population (1 in 3 is a non-resident/foreigner)

Methodology and assumptions

(b) Labour Force Projections

Assumptions:

Resident Labour Force:

- 2010 age-specific resident labour force participation rates apply throughout the projection period

Non-resident Labour Force:

- ratio of working to non-working non-residents is 4:1

Scenario analysis: Resident Population

S1: TFR1.24, no new citizens/PRs

- TFR of 1.24, no new citizens/PRs
- Resident population declines from 2020 onwards
- Elderly population grows sharply while young and working age population fall
- Potential support ratio drops sharply from 7.7 in 2010 to 1.7 in 2050
- Resident labour force drops sharply: CAGR -0.8% to 2050
- More leave the resident workforce than enter it from 2015

S3: TFR1.85, no new citizens/PRs

- TFR rises gradually to 1.85, no new citizens/PRs
- Resident population declines from 2030 onwards
- Potential support ratio falls to 1.9 in 2050
- Resident labour force decline arrested moderately: CAGR -0.6% to 2050
- Raising TFR from now only has an effect on the working age population in 15 years' time

S2: TFR1.24, 30000 new citizens/PRs per annum

- TFR of 1.24, net addition of 30,000 new citizens/PRs per annum
- Resident population growth sustained at 0.6% pa annum through 2050: 4.9million resident population in 2050, up from 3.8million in 2010
- Potential support ratio falls to 2.7 in 2050
- Resident labour force size grows: CAGR +0.4% to 2050
- Working age population grows but share of the total population still falls

Scenario analysis: Total Population and Labour Force

S2A: TFR1.24, 30000 new citizens/PRs, 1 in 4 persons a foreigner

- TFR of 1.24, net addition of 30000 new citizens/PRs per annum
- Non-resident population (NR) make up 25% of total population i.e. 1 in 4 persons a foreigner
- NR/foreigner intake of 14000 per annum from 2011-2020, then 11000 per annum from 2021-2030
- Total population growth sustained at 0.6% CAGR through 2050: 6.5million population in 2050
- Total workforce growth of 0.5% CAGR through 2050: 3.8million workforce in 2050

S2B: TFR1.24, 30000 new citizens/PRs, 1 in 5 persons a foreigner

- TFR of 1.24, net addition of 30000 new citizens/PRs per annum
- NR make up 20% of total population i.e. 1 in 5 persons a foreigner
- NR/foreigner reduction of 21000 per annum from 2011-2020, then 9000 per annum increase from 2021-2030
- Total population growth sustained at 0.5% CAGR through 2050: 6.1million population in 2050
- Total workforce growth of 0.3% CAGR through 2050: 3.5million workforce in 2050

Scenario analysis: Total Population and Labour Force

S2C: TFR1.24, 30000 new citizens/PRs, 1 in 3 persons a foreigner

- TFR of 1.24, net addition of 30000 new citizens/PRs per annum
- NR population make up 33% of total population i.e. 1 in 3 persons a foreigner
- NR/foreigner intake of 81000 per annum from 2011-2020, then 17000 per annum from 2021-2030
- Total population growth sustained at 0.9% CAGR through 2050: 7.3million population in 2050
- Total workforce growth of 0.9% CAGR through 2050: 4.4million workforce in 2050



S2D: TFR1.24, 30000 new citizens/PRs, approximately 1 in 3 persons a foreigner

- TFR of 1.24, net addition of 30000 new citizens/PRs per annum
- NR population make up 30% of total population i.e. approximately 1 in 3 persons a foreigner
- NR/foreigner intake of 54000 per annum from 2011-2020, then 15000 per annum from 2021-2030
- Total population growth sustained at 0.8% CAGR through 2050: 7.0million population in 2050
- Total workforce growth of 0.7% CAGR through 2050: 4.2million workforce in 2050

Resident Population Projection

SCENARIO 1

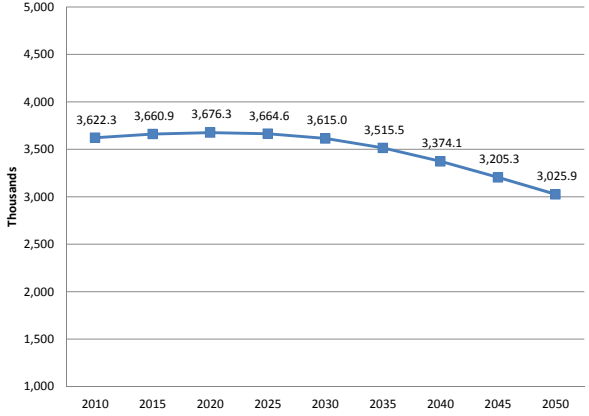
TFR 1.24, NO NEW CITIZENS/PRs

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S1: Resident population starts to shrink from 2020



Resident Population Size

If TFR remains at 1.24 and no new citizens/PRs are added, the Resident Population grows to about 3.7 m in 2020 and shrinks thereafter



Year	Resident Population (Thousands)
2010	3,622.3
2015	3,660.9
2020	3,676.3
2025	3,664.6
2030	3,615.0
2035	3,515.5
2040	3,374.1
2045	3,205.3
2050	3,025.9

Source: IPS projections 2012

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S1: Resident population extremely aged in 2050

The proportion of resident population aged 65 and older rises, from 10% in 2010 to 33.6% in 2050, while the young and working age population decline

The median age of the population rises from 39 in 2010 to 49 in 2030 and 55 in 2050

Resident Population by Broad Age Bands (%)

Age Band	2010	2020	2030	2040	2050
0-14	16.4	12.3	11.5	10.1	9.1
15-64	74.0	71.4	63.1	58.2	57.3
65+	9.6	16.4	25.4	31.7	33.6

S1: Support ratios change dramatically; more older people than young

Support Ratios and Ageing Index

	2010	2020	2030	2040	2050
Potential Support Ratio	7.7	4.4	2.5	1.8	1.7
Parent Support Ratio	9.4	11.8	21.6	44.6	52.8
Ageing Index	58.9	133.5	220.0	314.6	370.9

The number of working age persons 15-64 available to support one elderly 65 and older (Potential Support Ratio) declines from 7.7 in 2010 to 1.7 in 2050

The number of persons 80 years and over to be supported by 100 persons 50 to 64 years (Parent Support Ratio) increases from 9 to about 53 over the same period

The ratio of elderly 65+ to youths aged below 15 rises from about 59 to 371

Resident Population Projection

SCENARIO 3

TFR 1.85, NO NEW CITIZENS/PRs

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S3: Raising the TFR postpones decline of resident population

If the TFR rises to 1.85 and still no new citizens/PRs are added, the Resident Population grows to 3.73 m in 2030 and declines thereafter

The Potential Support Ratio improves marginally, to 1.9 in 2050, compared to 1.7 under Scenario 1

Scenario 3: Resident Population Size

	2010	2015	2020	2025	2030	2035	2040	2045	2050
Scenario 1	3,622.3	3,660.9	3,676.3	3,664.6	3,615.0	3,515.5	3,374.1	3,205.3	3,025.9
Scenario 3	3,622.3	3,670.4	3,695.2	3,719.8	3,733.3	3,690.0	3,601.7	3,488.1	3,372.6

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Resident Population Projection

SCENARIO 2

TFR 1.24, 30K NEW CITIZENS/PRs P.A.

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S2: Resident population decline arrested

If the TFR remains constant at 1.24, adding 30000 new residents each year arrests the decline in the Resident Population

Approximately zero population growth rate towards end of projection period

Resident Population Size

	2010	2015	2020	2025	2030	2035	2040	2045	2050
Scenario 1	3,622.3	3,660.9	3,676.3	3,664.6	3,615.0	3,515.5	3,374.1	3,205.3	3,025.9
Scenario 2	3,781.9	3,999.1	4,208.7	4,400.4	4,561.0	4,679.9	4,766.6	4,833.5	4,894.1
Scenario 3	3,622.3	3,670.4	3,695.2	3,719.8	3,733.3	3,690.0	3,601.7	3,488.1	3,372.6

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S2: Resident population ages less rapidly

Resident Population by Broad Age Bands (in %)

Age Band	2010	2020	2030	2040	2050
0-14	16.9	14.8	14.7	13.7	13.3
15-64	73.9	70.8	65.1	63.2	63.3
65+	9.3	14.3	20.3	23.1	23.4

The proportion of the resident population aged 65 and older still rises but more slowly, to 23% in 2050.

There will also be more young and working age persons compared to Scenario 1, as shown in the next slide

Resident Population ages more slowly in Scenario 2 compared to Scenario 1 but still older than in 2010

Resident Population by Broad Age Bands (%): S1 and S2 compared

Scenario 1					
	2010	2020	2030	2040	2050
0-14	16.4	12.3	11.5	10.1	9.1
15-64	74.0	71.4	63.1	58.2	57.3
65+	9.6	16.4	25.4	31.7	33.6
Scenario 2					
0-14	16.9	14.8	14.7	13.7	13.3
15-64	73.9	70.8	65.1	63.2	63.3
65+	9.3	14.3	20.3	23.1	23.4

The median age of the population under Scenario 2 rises to 42 in 2030 and 46 in 2050 – lower than under Scenario 1

Less severe support ratios in Scenario 2 compared with Scenario 1 but still lower/higher than in 2010

Support Ratios: S1 and S2 Compared

	2010	2020	2030	2040	2050
Potential Support Ratio	7.7	4.4	2.5	1.8	1.7
	8.0	4.9	3.2	2.7	2.7
Parent Support Ratio	9.4	11.8	21.6	44.6	52.8
	9.4	11.6	20.0	34.3	37.1

Note: Figures for Scenario 1 in red

Definitions:

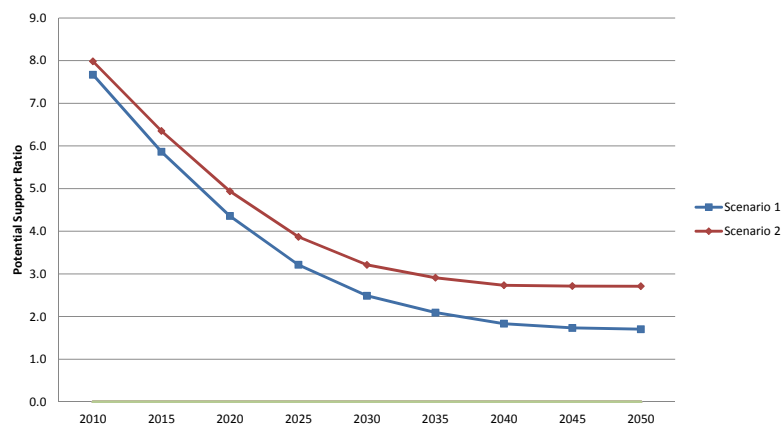
The **potential support ratio** is the number of persons aged 15 to 64 per person aged 65 or older.

The **parent support ratio** is the number of persons 80 years old and over per one hundred persons 50 to 64 years.



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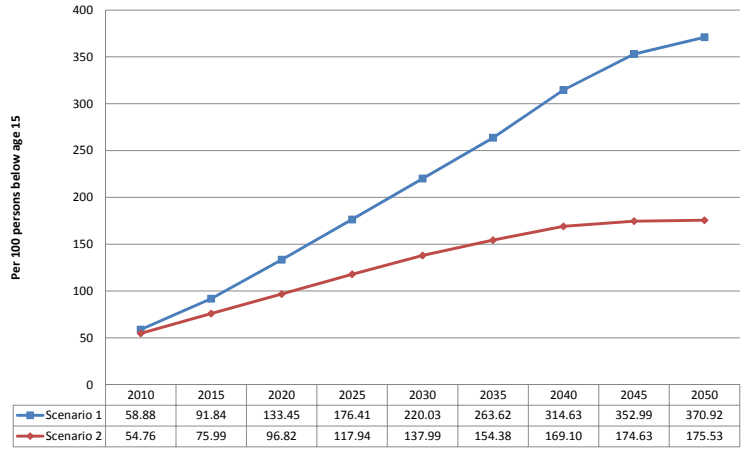
Potential Support Ratios: S1 and S2 compared:



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Fewer elderly to young population in Scenario 2 compared to Scenario 1 but still triple that in 2010

Ageing Index: S1 and S2 Compared



The ageing index is the number of persons 65 years old or over per hundred persons under age 15.

Total Population and Labour Force Projection

**TOTAL POPULATION SCENARIOS:
2A, 2B, 2C AND 2D**

Projection of Total Population (Recap)

Total Population = Resident + Non-Resident (NR) Population

Base Population:

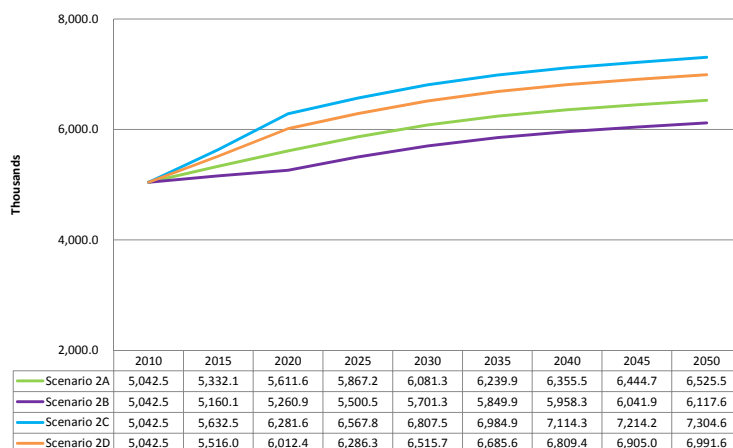
Scenario 2 projected resident population

NR Assumptions:

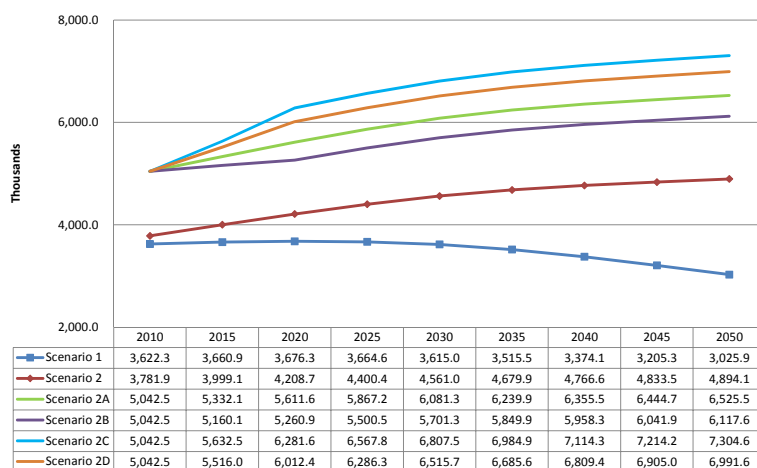
- Scenario 2A:** NR = 25% of Total Population
1 in 4 persons a non-resident/foreigner ("current" scenario)
- Scenario 2B:** NR declines from 25% to 20% of Total Population by 2020 & remains constant thereafter
1 in 5 persons a non-resident/foreigner
- Scenario 2C:** NR rises from 25% to 33% of Total Population by 2020 & remains constant thereafter
1 in 3 persons a non-resident/foreigner
- Scenario 2D:** NR rises from 25% to 30% of Total Population by 2020 & remains constant thereafter
3 in 10 persons a non-resident/foreigner

S2A-D: Higher NR proportion means larger Total Population

Total Population: Scenarios 2A-D Compared

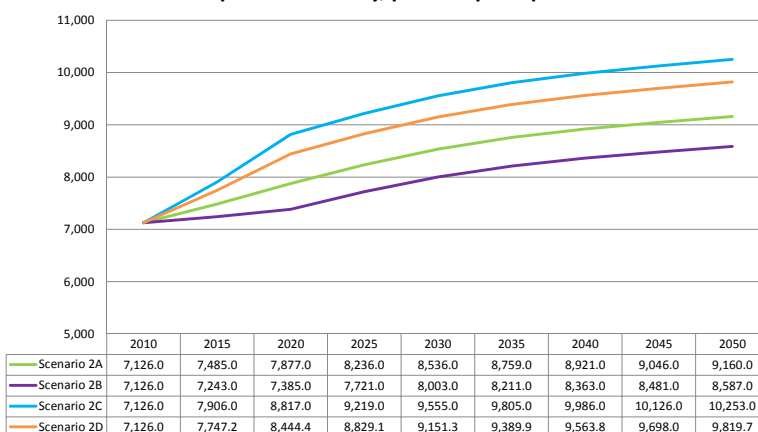


Resident vs Total Population Size: S1, S2, S2A-D Compared



Population Density

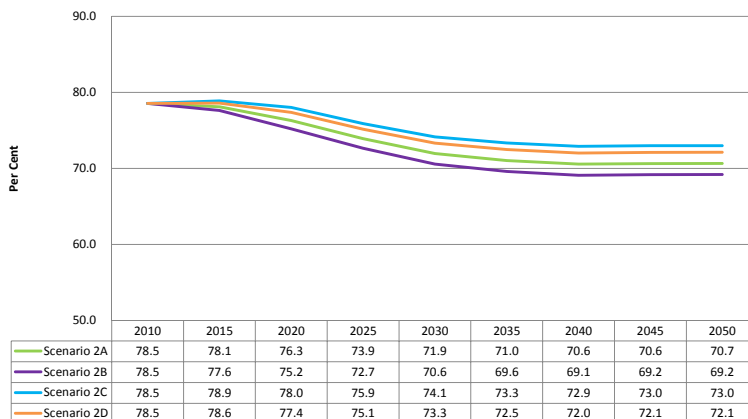
Population density, persons per sq km



Assumes no change in Singapore's land-area from 2010
Source: IPS projections 2012

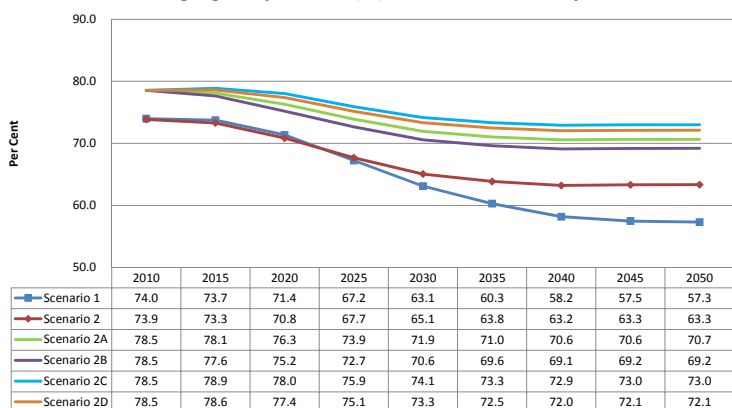
Higher NR proportion mitigates decline of working age population

Working Age Total Population (%): S2A-D Compared



Resident vs Total Working Age Population

Working Age Population (%): S1, S2, S2A-D Compared



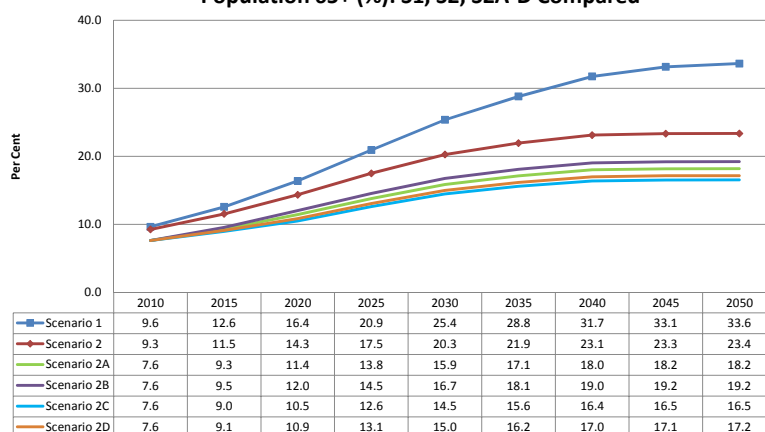
Higher NR proportion mitigates increase in proportion of 65+

65+ Total Population (%): S2A-D Compared



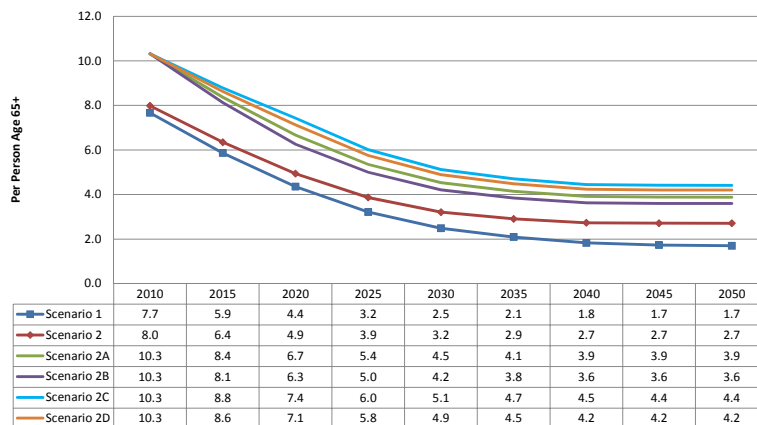
Resident vs Total Population 65+

Population 65+ (%): S1, S2, S2A-D Compared



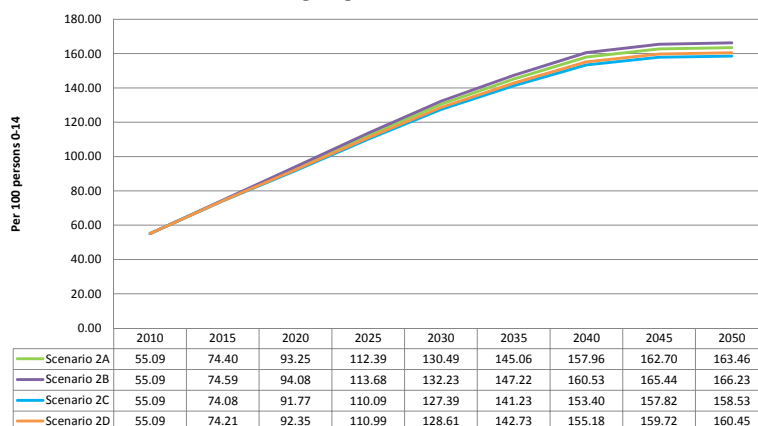
Resident vs Total Potential Support Ratios

Potential Support Ratio: S1, S2, S2A-D Compared



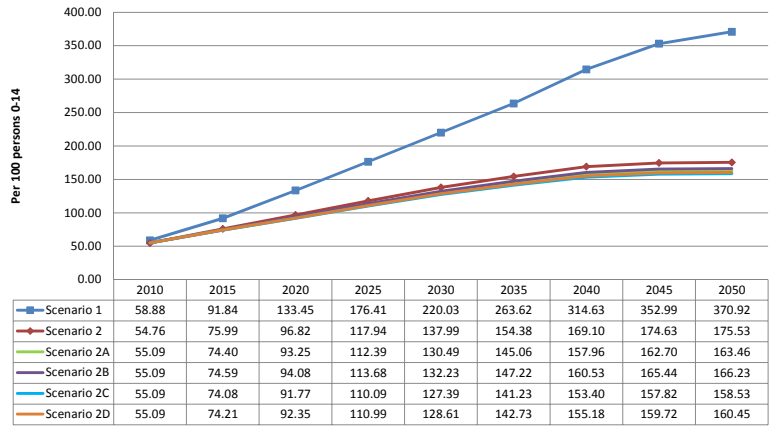
Ratio of 65+ to young not affected by NR proportions

Ageing Index: S2A-D



Resident vs Total Ageing Index

Ageing Index: S1, S2, S2A-D Compared



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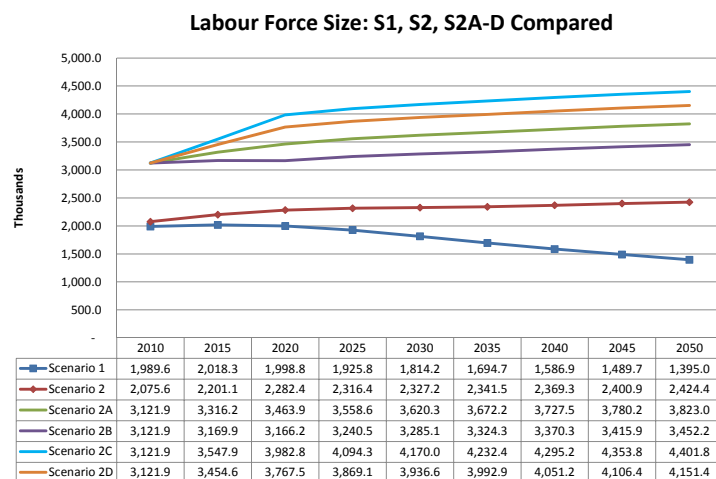
Labour Force Projection

TOTAL, RESIDENT AND NON-RESIDENT LABOUR FORCE



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NRs increase size of Labour Force



Change in Total Labour Force 2010-2050

Change in Total Labour Force (per year, in thousands)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2020	34.2	4.4	86.1	64.6
2020-2030	15.6	11.9	18.7	16.9
2030-2040	10.7	8.5	12.5	11.5
2040-2050	9.5	8.2	10.7	10.0

Average yearly growth over next 20 years (per year, in thousands)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2030	24.9	8.2	52.4	40.7

Growth in Total Labour Force 2010-2050

Compound annual growth in Total Labour Force (CAGR %)

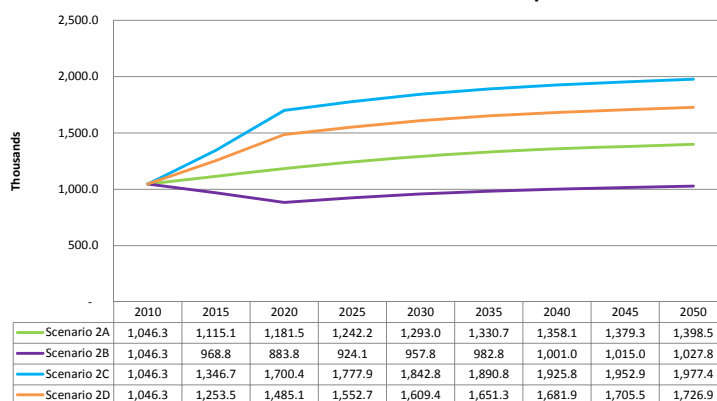
	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2020	1.04	0.14	2.47	1.90
2020-2030	0.44	0.37	0.46	0.44
2030-2040	0.29	0.26	0.30	0.29
2040-2050	0.25	0.24	0.25	0.24

Compound annual growth rate over next 20 years (CAGR %)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2030	0.74	0.26	1.46	1.17

NR labour force declines and then stabilises at about 1 million if NR reduced to 20%

Non-Resident Labour Force: S2A-D Compared



Change in Non-Resident Labour Force 2010-2050

Change in Non-Resident Labour Force (per year, in thousands)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2020	13.5	(16.2)	65.4	43.9
2020-2030	11.2	7.4	14.2	12.4
2030-2040	6.5	4.3	8.3	7.3
2040-2050	4.0	2.7	5.2	4.5

Average yearly growth over next 20 years (per year, in thousands)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2030	12	-4	40	28

Growth in Non-Resident Labour Force 2010-2050

Compound annual growth in Non-Resident Labour Force (CAGR %)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2020	1.22	-1.67	4.98	3.56
2020-2030	0.91	0.81	0.81	0.81
2030-2040	0.49	0.44	0.44	0.44
2040-2050	0.29	0.26	0.26	0.26

Compound annual growth rate over next 20 years (CAGR %)

	Scenario 2A	Scenario 2B	Scenario 2C	Scenario 2D
2010-2030	1.06	-0.44	2.87	2.18

Discussion topics

- **What is the impact of these population trends on Singapore's:**
 - **Society and family**
 - Changing generational mix may potentially create divisions between young and old
 - In-migration can offset the ageing and shrinking of the population, but could introduce social and economic tensions between foreigners and locals
 - **Economy**
 - Will Singapore's growth model have to be adjusted to ensure sustained economic growth and prosperity without inequity?
 - How will the country's economic performance and resilience be affected by its immigration policies?
 - **The quality of life**
 - While the economy may be more vibrant with higher levels of in-migration, will the quality of life be affected by increased population density and the consequent pressures on the country's infrastructure?
- **What are the trade-offs between economic growth, social ties and the quality of life?**